

CLAIMS

1. A data storage device for storing digital information in a readable form comprises one or more memory elements, each memory element
5 comprising a planar magnetic conduit capable of sustaining and propagating a magnetic domain wall formed into a continuous propagation track, wherein each continuous track is provided with at least one inversion node whereat the magnetisation direction of a domain wall propagating along the conduit under action of a suitable applied
10 field is changed, each inversion node comprising a portion in which a direction change away from the initial path and a subsequent direction change back to the initial path are provided in the conduit such that no direct propagation path is possible across the deviating portion.
- 15 2. A data storage device in accordance with claim 1 wherein each continuous track is provided with at least one inversion node whereat the magnetisation direction of a domain wall propagating along the conduit under action of a suitable applied field is substantially reversed.
- 20 3. A data storage device in accordance with claim 1 or claim 2 wherein each continuous track is provided with a large plurality of inversion nodes.
4. A data storage device in accordance with any preceding claim wherein a
25 conduit is formed into a closed loop to comprise a continuous propagation track.
5. A data storage device in accordance with any preceding claim wherein a conduit does not form an entire closed loop but a chain of inversion

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nodes, and means are provided to transfer data between the two ends thereof so that data is still able to circulate around an apparently closed loop, the means comprising a data writing facility at one end of the chain and data reading facility at the other end of the chain, and additional
5 circuitry to feed the data back electronically from the output of the chain to the input of the chain.

6. A data storage device in accordance with any preceding claim wherein deviations comprise 90° deviations from the initial path of the conduit.
- 10 7. A data storage device in accordance with any preceding claim wherein deviations from the initial path occur gradually over a distance along the conduit track.
- 15 8. A data storage device in accordance with any preceding claim wherein the inversion node comprises a cycloidal portion within a conduit loop structure or a topological equivalent of such a structure.
- 20 9. A data storage device in accordance with claim 8 comprising a plurality of such cycloidal portions provided in each loop.
10. A data storage device in accordance with claim 9 comprising a number of magnetic conduits formed into closed loops each comprising a plurality of cycloids serving to effect abrupt directional reversals in a
25 magnetisation direction of a domain wall passing thereacross.
11. A data storage device in accordance with one of claims 8 to 10 wherein each cycloid has a turning radius which is in the range three to ten times the conduit width.

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12. A data storage device in accordance with any preceding claim wherein the magnetic conduit comprises a particular generally planar magnetic wire on a suitable substrate.

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13. A data storage device in accordance with claim 12 wherein the magnetic wire comprises a magnetic nanowire with a thickness of between 2 nm and 25 nm and a width of between 50 nm and 1 μm .

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AMENDED SHEET